

REMARKS

Applicants have carefully reviewed and considered the Office Action mailed on September 29, 2003.

Claims 27 and 37 have been amended. New claims 46-52 have been added. Claims 1-21, 30-34, and 41-45 were previously canceled. As a result, claims 22-29, 35-40, and 46-52 are now pending in this application.

Amendments to the Specification and Title

The title has been amended to more accurately reflect the claimed subject matter.

In the paragraph beginning on page 4, line 12, the sentence “Such embodiments of the inventive subject matter may be referred to, individually and/or collectively, herein by the term “invention” merely for convenience and without intending to voluntarily limit the scope of this application to any single invention or inventive concept if more than one is in fact disclosed.” has been inserted.

The subtitle “Conclusion” has been deleted on page 15, line 1.

The paragraph beginning on page 16, line 21 has been amended by inserting “inventive” before “subject matter”.

No new matter has been introduced through these amendments to the specification.

Amendments to Claims 27 and 37

Independent claims 27 and 37 have been amended. No new matter has been introduced.

In claim 27, the language “squeeze out” has been substituted for “remove”. Support for this amendment may be found, for example, on page 11, line 4, of the original written description.

In claim 37, the term “(IC)” has been deleted; the phrase “except that substantially no particles are in the connections” has been deleted; the words “some of” have been inserted; the word “shape” has been substituted for “composition”; the phrase “physical and electrical contact” has been substituted for “connections”; the word “such” has been inserted; the word “remained” has been substituted for “are”; and the phrase “and wherein any particles remaining in the connections are of such size and shape that they do not prevent adequate physical and

electrical contact between corresponding terminals and pads” has been added. Support may be found, for example, in the two paragraphs beginning on page 10, line 27.

The amendments to the claims are made to satisfy Applicants’ preferences, not necessarily to satisfy any legal requirement(s) of the patent laws, and they are not intended to limit the scope of equivalents to which any claim element may be entitled.

New Claims 46-52

New claims 46-52 have been added to provide Applicants with additional protection to which Applicants are entitled. New claims 46-52 are supported by the original disclosure. No new matter has been introduced.

New dependent claims 46 and 47 are identical except for their claim dependency. Claims 46 and 47 recite that the underfill material further comprises a fluxing agent and that, in the operation of applying suitable heat, the fluxing agent cleans the terminals and the pads. Support may be found, for example, on page 10, lines 2-4.

New independent claim 48 recites an electronic assembly comprising at least one integrated circuit package having a plurality of terminals; a substrate having a plurality of pads to be coupled to the plurality of terminals via a corresponding plurality of connections; and an unhardened underfill covering the terminals and pads. Claim 48 contains additional limitations regarding the underfill, including particles and a fluxing agent contained therein. Support may be found, for example, in original claim 27; in FIGS. 8A-8B and the corresponding written description; and in the two paragraphs beginning on page 10, line 27.

New dependent claims 49 and 50 are identical to canceled claims 38 and 39, except for the claim dependency.

New dependent claim 51 is similar to pending claim 40.

New dependent claim 52 is similar to original claim 12.

Objection to Amendment filed June 25, 2003

The Examiner objected under 35 U.S.C. 132 to the Amendment filed June 25, 2003, asserting that it introduces new matter into the disclosure. The Examiner asserted that the added material that is not supported by the original disclosure is the deletion of the word “invention”

and the addition of the words “subject matter” and “embodiments of”. The Examiner asserted that the word “subject matter” is broader than the word “invention”.

In the present response, Applicants have further amended the paragraph beginning on page 16, line 21 by inserting “inventive” before “subject matter”. Applicants prefer to use the expression “inventive subject matter” rather than the term “invention”, because Applicants are concerned that the latter term may be incorrectly interpreted in a manner that may limit the scope of Applicants’ disclosure and claims to a single inventive entity, whereas Applicants believe the expression “inventive subject matter” is not so limiting. The Examiner indeed has twice restricted the inventive subject matter of the present application, thus supporting Applicants’ position that it contains more than a single “invention” or “embodiment”.

Applicants also respectfully point out that there is ample support for the term “subject matter” in the patent laws, e.g. in 35 U.S.C. §112, 2nd paragraph, and in 37 C.F.R. §1.75(a).

Likewise, ample support for the term “embodiments” may be found in the patent laws, e.g. in MPEP §806.04(e).

Accordingly, Applicants respectfully assert that no new matter has been introduced by Applicants’ substituting the terms “inventive subject matter” or “embodiments of the invention” for the word “invention” in the written description.

For the above reasons, Applicants respectfully request that the Examiner withdraw the objection to the amendment of the paragraph beginning on page 16, line 21 made in the June 25, 2003 response, and as amended further in the present response, insofar as the expression “inventive subject matter” has been substituted for the word “invention”, and the expression “embodiments of this invention” has been substituted for “this invention”.

**Rejection of Claims 22-29 and 35-40 under 35 U.S.C. §103(a) as Unpatentable
over Goossen in combination with Garrett**

Claims 22-29 and 35-40 were rejected under 35 U.S.C. §103(a) as being unpatentable over Goossen (U.S. 5,975,408) in combination with Garrett (U.S. 2002/0128354). Applicants do not admit that Garrett is prior art and reserve the right to swear behind Garrett as provided for under 37 C.F.R. §1.131.

Goossen discloses a technique for solder bump bonding in which an underfill is applied to the surface of an interconnection substrate prior to solder bump bonding. The underfill is cured in the same heating step used to effect thermocompression bonding of the solder bumps. Refer to the Abstract.

Garrett discloses encapsulation compounds that may include a silica filler. The silica may be spherical. Particle size may be from .5 microns to 40 microns. Silica may be in the range of 60-90% of the formulation. (Refer to Paragraphs 0009 and 0022.)

To establish a *prima facie* case of obviousness under 35 U.S.C. §103, the prior art reference (or references when combined) must teach or suggest every limitation of the claim. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA, 1974). MPEP §2143.

The asserted combination of Goossen and Garrett fails to teach or suggest all of the claim limitations present in independent claim 22 and in independent claim 27, as the latter claim has been amended, so a *prima facie* case of obviousness has not been established.

For example, regarding independent claim 22, neither Goossen nor Garrett discloses a component package having an underfill material comprising particles that potentially inhibit a suitable connection between corresponding terminals and pads unless the particles are substantially removed. Nor do Goossen or Garrett discloses a component package fabricated by applying suitable pressure to cause the terminals to physically contact the pads and to remove substantially all potentially inhibiting particles from between corresponding terminals and pads.

Similarly, regarding independent claim 27, neither Goossen nor Garrett discloses an electronic assembly having underfill material comprising particles that potentially inhibit a suitable connection between corresponding terminals and pads unless the particles are substantially removed. Nor does Goossen or Garrett disclose an electronic assembly fabricated by applying suitable pressure to cause the terminals to physically contact the pads and to squeeze out substantially all potentially inhibiting particles from between corresponding terminals and pads.

For the above reasons, independent claims 22 and 27 should be found to be allowable over any combination of Goossen and Garrett, and Applicants respectfully request that the rejection of claims 22 and 27 under 35 U.S.C. §103(a) as being unpatentable over the combination of Goossen and Garrett should be withdrawn.

Likewise, claims 23-26 and 35, which are dependent directly or indirectly upon claim 22, should be allowable.

Similarly, claims 28, 29, and 36, which are dependent directly or indirectly upon claim 27, should be allowable.

Regarding independent claim 37, neither Goossen nor Garrett discloses an electronic assembly having a hardened underfill comprising particles, wherein some of the particles are of such size and shape as to potentially inhibit suitable physical and electrical contact between corresponding terminals and pads if such particles remained in the connections, and wherein any particles remaining in the connections are of such size and shape that they do not prevent adequate physical and electrical contact between corresponding terminals and pads.

Thus, independent claim 37 should be found to be allowable over any combination of Goossen and Garrett, and Applicants respectfully request that the rejection of claim 37 under 35 U.S.C. §103(a) as being unpatentable over the combination of Goossen and Garrett should be withdrawn.

Likewise, claims 38-40, which are dependent upon claim 37, should be allowable.

Allowability of New Claims 48-52

New dependent claim 48 has been added to provide Applicants with additional protection to which Applicants are entitled.

Both Goossen and Garret were discussed above.

Neither Goossen nor Garrett discloses an electronic assembly having an unhardened underfill comprising particles, wherein some of the particles are of such size and shape as to potentially inhibit suitable connections between corresponding terminals and pads, wherein the terminals are to physically contact the pads, wherein substantially all of the particles are to be removed from between the terminals and the pads when suitable pressure is applied to the package and/or the substrate, and wherein the underfill further comprises a fluxing agent to clean the terminals and pads when suitable heat is applied to the electronic assembly to connect the terminals and pads.

Likewise, claims 49-52, which are dependent upon claim 48, should be allowable.

Additional Elements and Limitations

Applicants consider additional elements and limitations of claims 22-29, 35-40, and 46-52 to further distinguish over the cited references, and Applicants reserve the right to present arguments to this effect at a later date.

Documents Cited But Not Relied Upon For This Office Action

Applicants need not respond to the assertion of pertinence stated for the references cited but not relied upon by the Office Action, because these references are not made part of the rejections in this Office Action. Applicants are expressly not admitting to this assertion and reserve the right to address the assertion should it form part of future rejections.

Conclusion

Applicants respectfully submit that claims 22-29, 35-40, and 46-52 are in condition for allowance, and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicants' attorney, Walter W. Nielsen (located in Phoenix, Arizona) at (602) 298-8920, or the below-signed attorney (located in Minneapolis, Minnesota) to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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Date Dec. 29, 2003

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Mail Stop RCE, Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 29 day of December, 2003

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